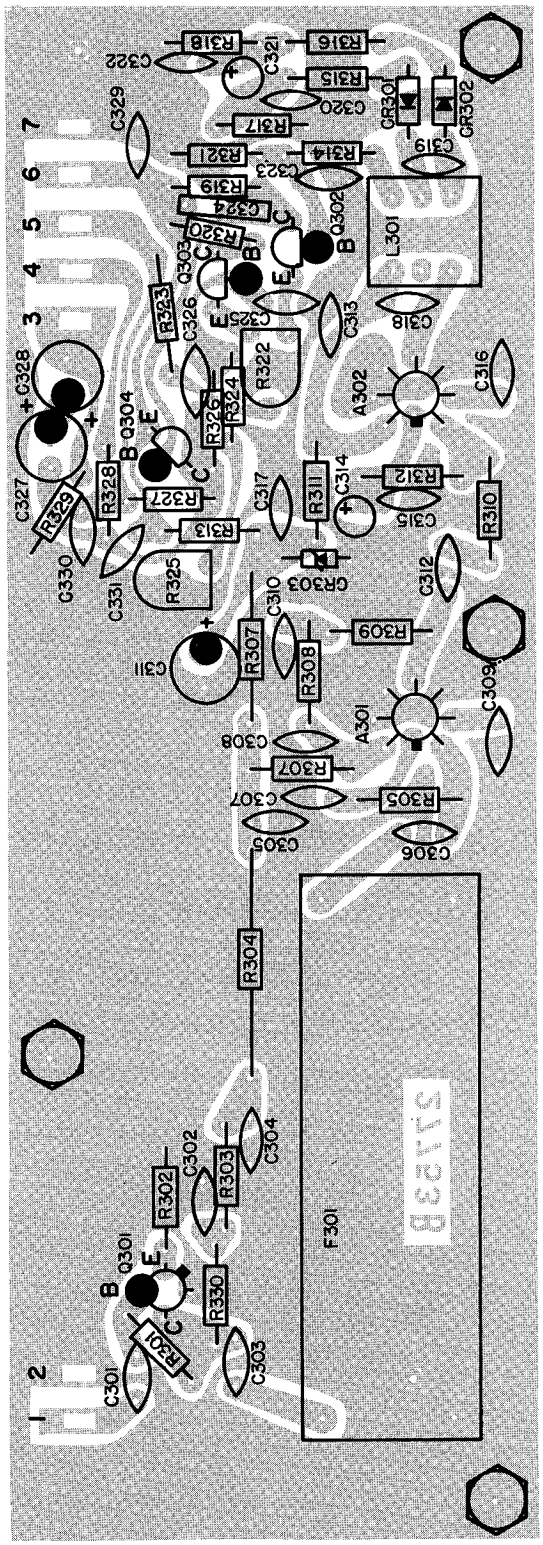
The Citation Fifteen

Professional FM/Stereo FM Tuner

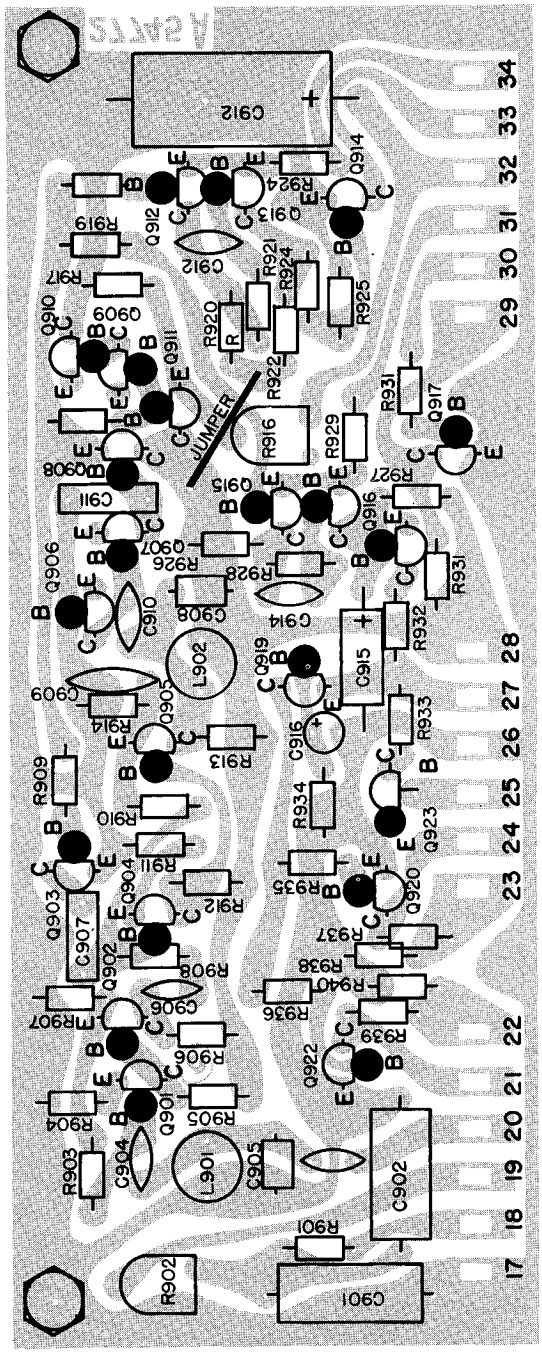
Technical Manual

harman/kardon

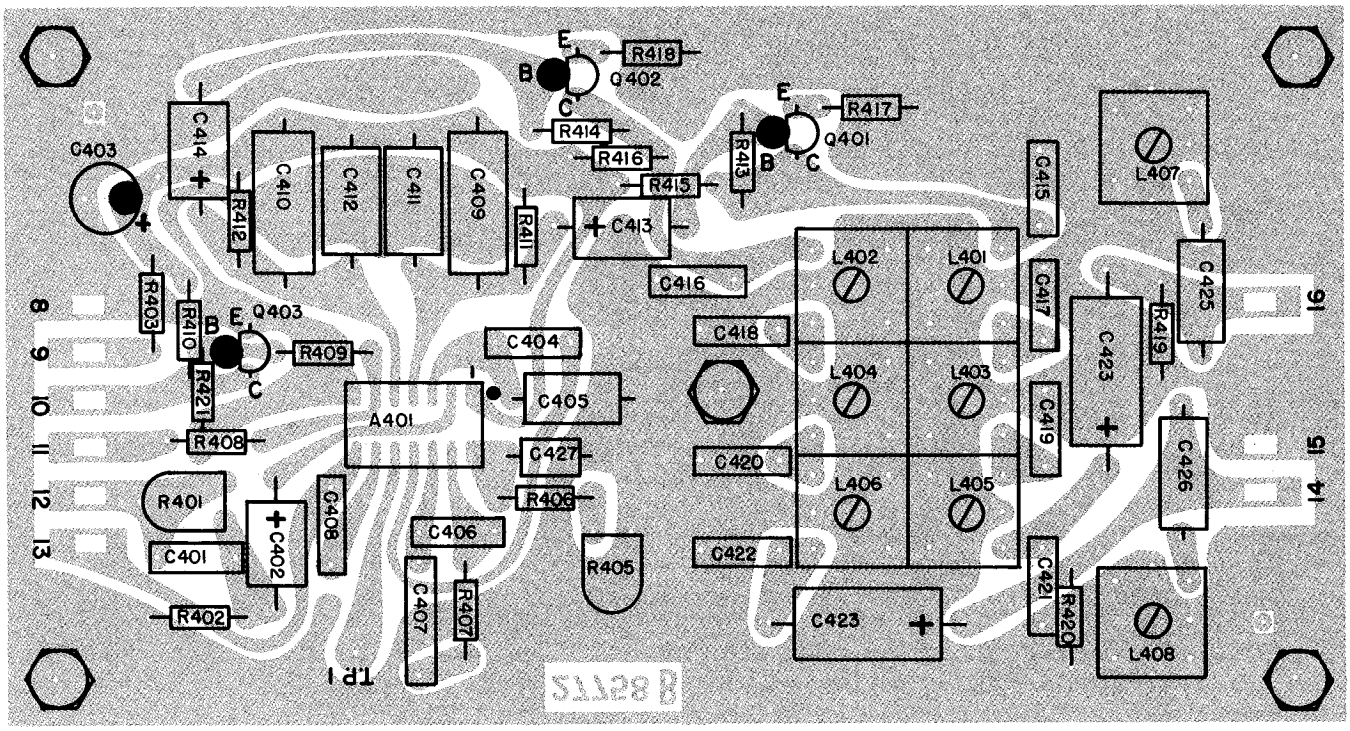
IF METER AMP BOARD



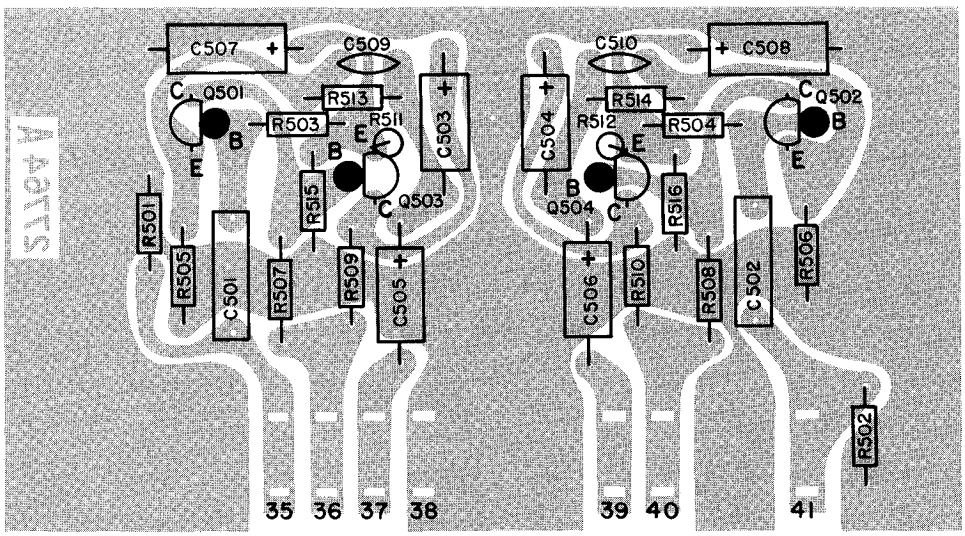
METER MUTING BOARD



MULTIPLEX/MULTIPLEX FILTER BOARD



OUTPUT BOARD



CITATION FIFTEEN ALIGNMENT PROCEDURE

Do not attempt alignment unless the following equipment is available:

1. FM Signal generator
2. Oscilloscope – must have at least 4.5 MHz bandwidth
3. AC – V.T.V.M.
4. Audio Generator
5. Multiplex generator
6. Harmonic distortion analyzer
7. Frequency counter

Before FM alignment is started, check mechanical zero of center balance meter with unit off. Adjust mechanical zero if necessary.

FM ALIGNMENT

1. Observe output at the fixed output jacks with the scope and harmonic analyzer.
2. Short pin #4 of the 2nd IC-A302 to the case of IC-A302.
3. Set the offset control R322 located on the IF/meter amp board for zero center on the tuning meter.
4. Remove the short from pin 4 of IC-A302. Using only noise (No input signal of any kind), adjust the top of the ratio detector transformer for zero center on the tuning meter. Be sure that the meter swings positive and negative from this point of adjustment.
5. Set FM generator at 90 MHz – 400 Hz – 100% modulation. Use 1000 microvolts signal strength. Tune in signal for zero on tuning meter. Adjust the bottom of the ratio detector transformer for minimum harmonic distortion. Use care that output level does not drop during this adjustment.
6. Reduce the R.F. level of the generator to the weakest signal which still permits observation of the sine wave output. Set the tuning dial of the Citation 15 to 90 MHz. Adjust the coils L105 – L101 – T102 – T103 for maximum signal and best symmetry of sine wave output. (Best useable sensitivity as measured on the Harmonic analyzer).
7. Tune the Generator to 106 MHz – tune to 106 on the Citation 15. Adjust C128B – C101B – C106B – C113B as in step #6.
8. Repeat steps 6 & 7 until no further improvement can be achieved.
9. Adjust T104 for best usable sensitivity.
10. Increase R.F. input level to 1000 microvolts – modulate at 10 KHz – 100% – Slightly optimize T104 for lowest harmonic distortion. No more than 1/2 turn on either top or bottom adjustment should be necessary.
11. Recheck tuning meter for zero on noise only. If not at zero – repeat steps 4 through 9.

MX ALIGNMENT

1. Using multiplex signal at 1000 microvolt level, observe composite waveform at FM output jack. (before de-emphasis) Adjust I.F. frequency compensation control R325 for flat base line on composite signal.
2. Using CW 1000 microvolts R.F. input signal, observe counter at 19 KHz test point TP-1 on Multiplex board. Adjust 19 KHz oscillator control R **405** for 19 KC.
3. Using 9% pilot signal as the only modulation, adjust 19 KC traps L **407** and L **408** for minimum output as observed at the fixed output jacks.
4. Using 1 KHz stereo modulation, adjust separation control R **401** for maximum separation.
5. Using 10 KHz stereo modulation, optimize the 19 KHz oscillator control slightly for maximum 10 KHz separation.

MISC. ADJUSTMENTS

MONO LEVEL ADJUST

Using a mono 400 Hz 100% signal, adjust the mono level control on meter muting board so that there is no level change between the auto stereo and the mono positions of the mode switch.

QUIETING METER ADJUST

With no signal input, adjust quieting meter control for full right deflection of the quieting meter.

INTERNAL 400 Hz OSCILLATOR

Adjust oscillator output level control **R811** so that the output level at the fixed output jacks is 6db below that achieved with 400 Hz 100% modulated FM mono signal.

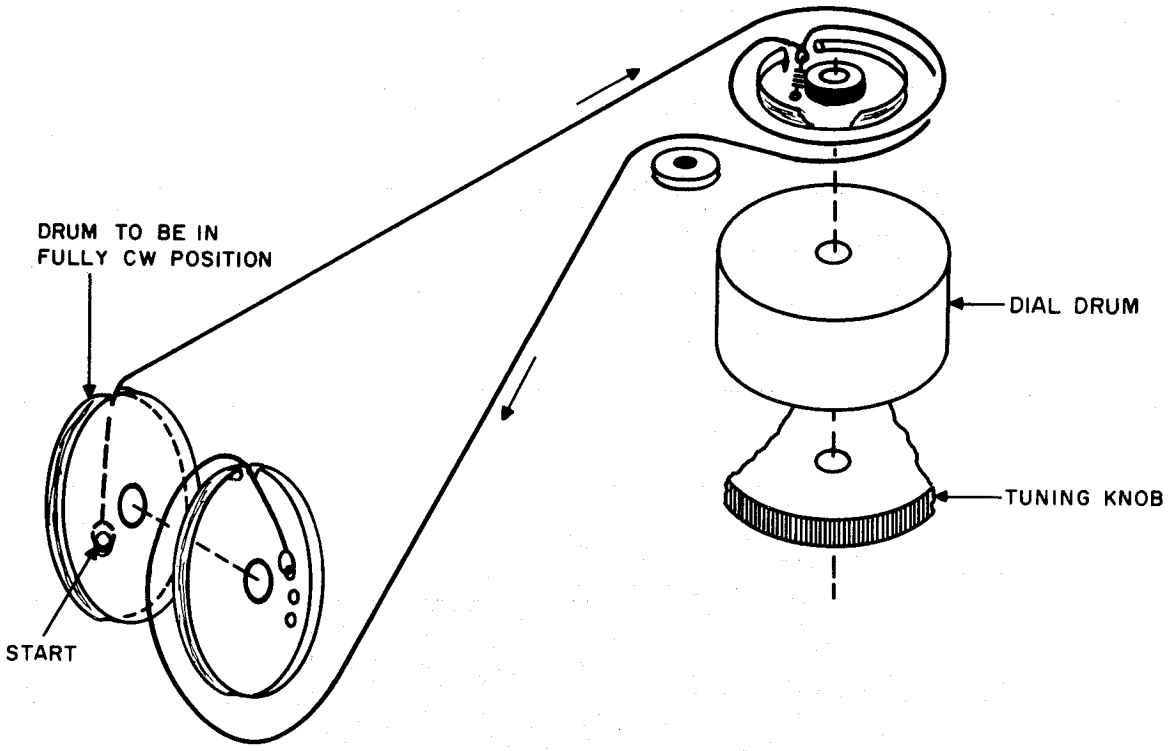
Special Notes

L-401, L-402, L-403, L-405, L-406 are factory adjusted – Do not attempt to adjust these precision inductors.

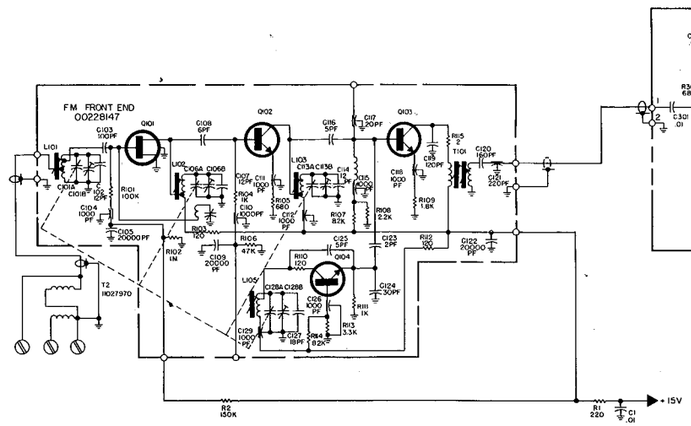
If any have been maladjusted, the procedure to be followed is:

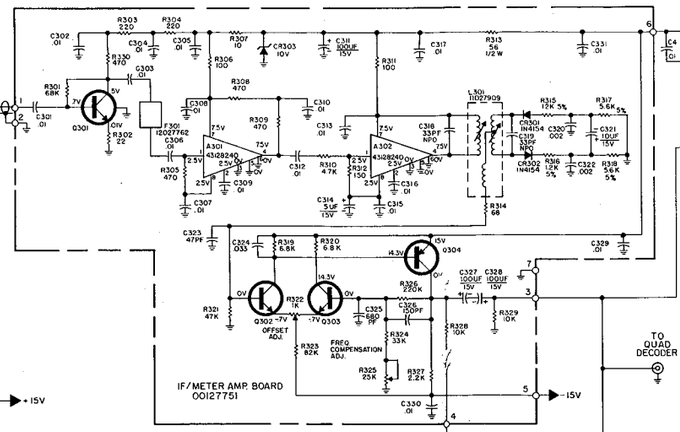
1. Remove inductor from P.C. Board.
2. Adjust inductor to schematic value with inductance bridge.
3. Replace in P.C. Board.

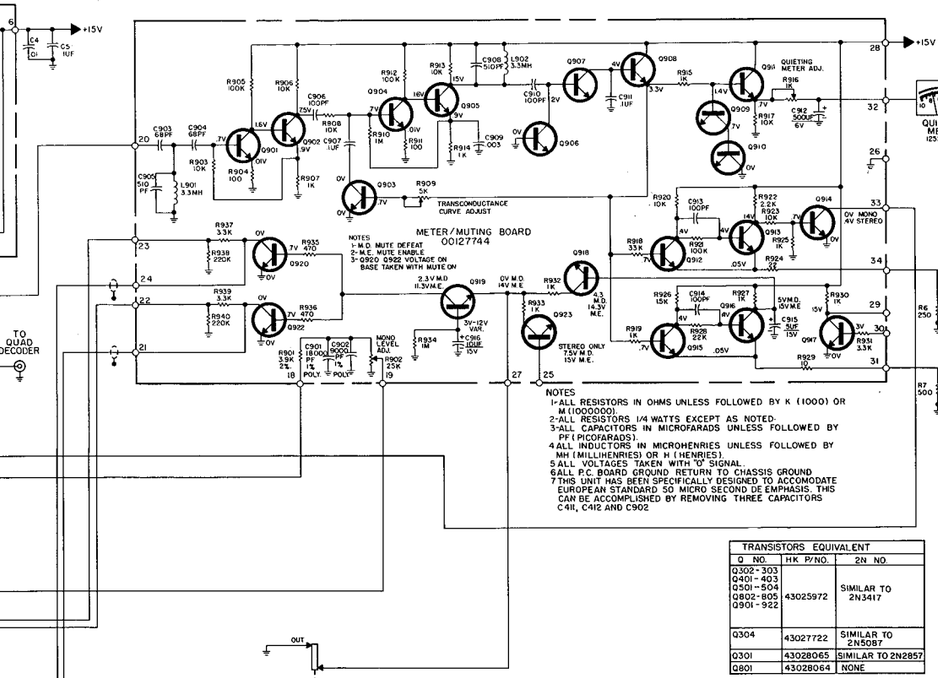
STRINGING DIAGRAM



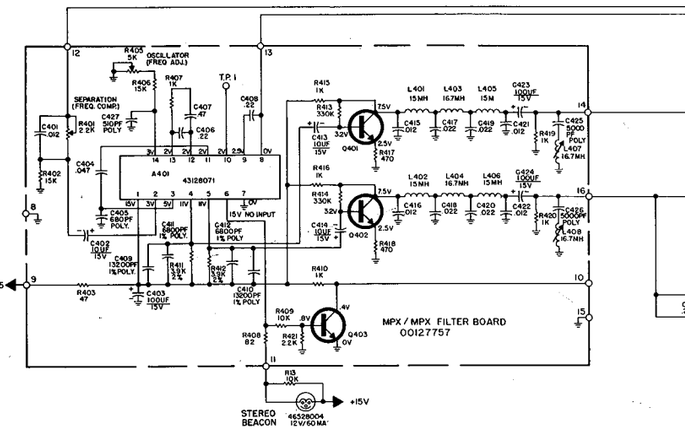
SCHEMATIC DIAGRAM — CITATION FIFTEEN

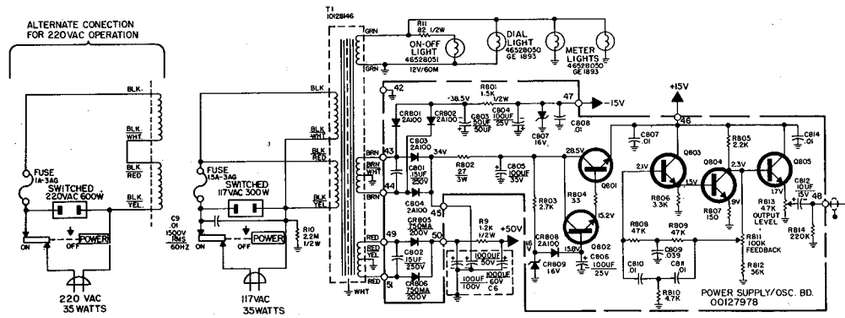


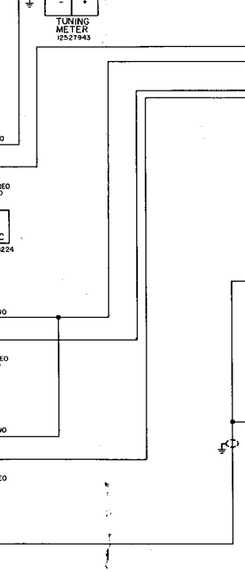


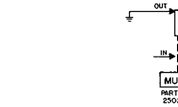


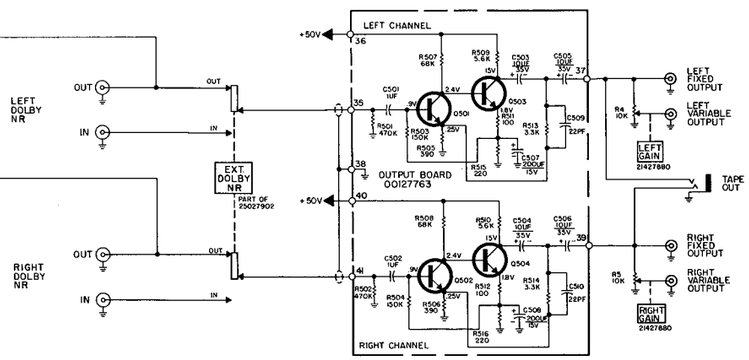
TRANSISTORS EQUIVALENT		
Q NO.	HK P/NO.	2N NO.
Q302-303 Q401-403 Q501-504 Q802-805 Q901-922	43025972	SIMILAR TO 2N3417
Q304	43027722	SIMILAR TO 2N5087
Q301	43028065	SIMILAR TO 2N2857
Q801	43028064	NONE



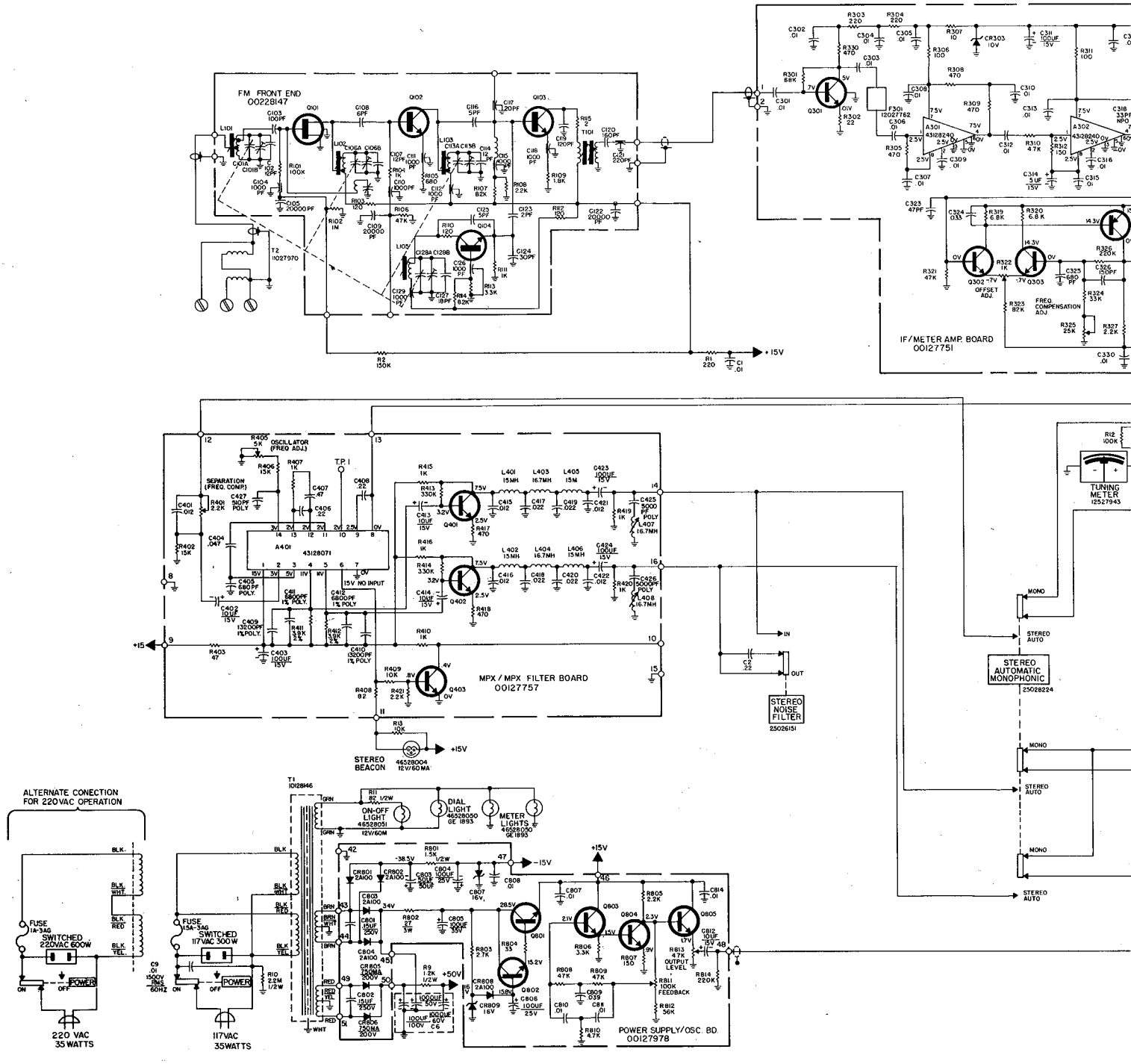


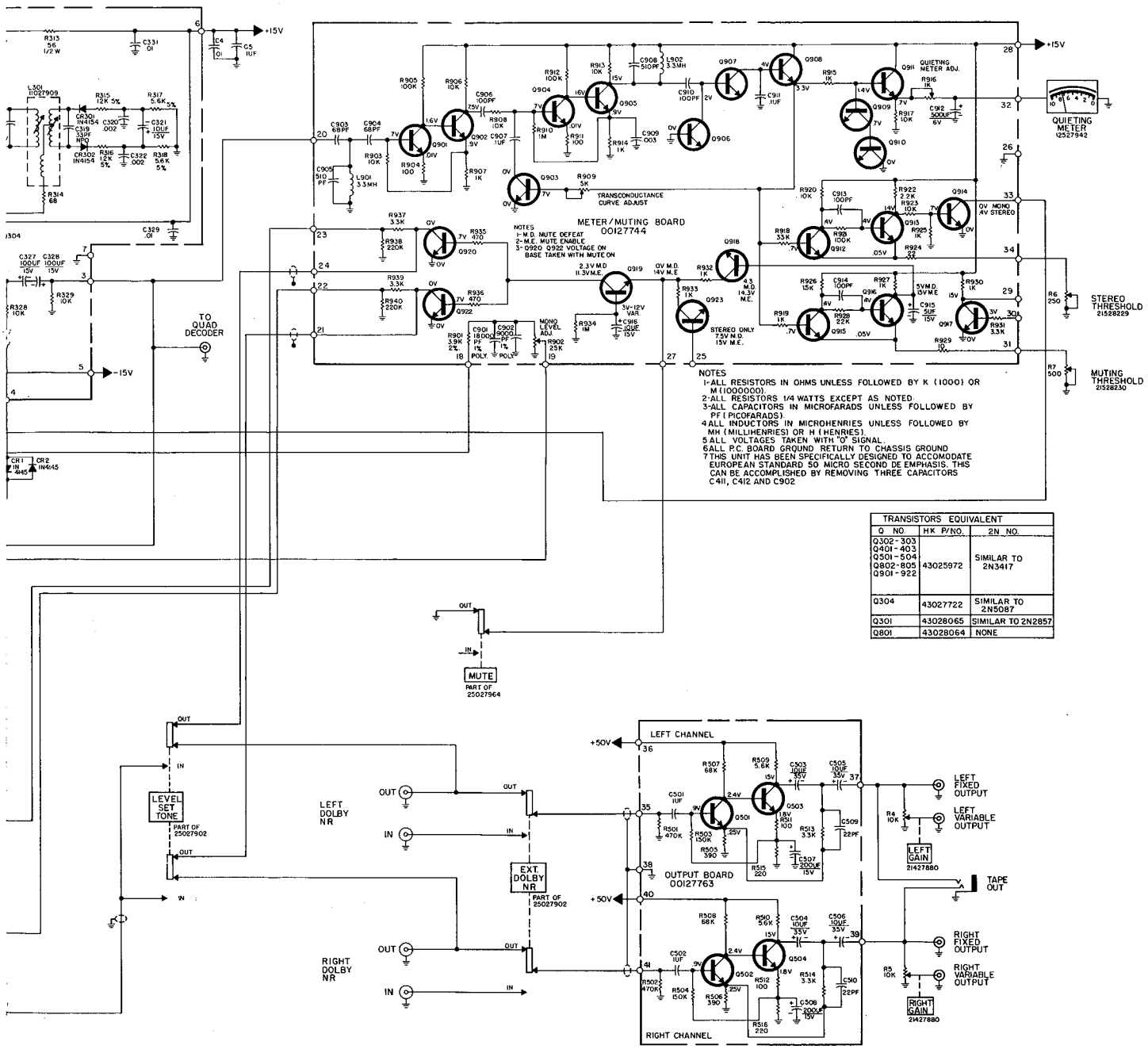






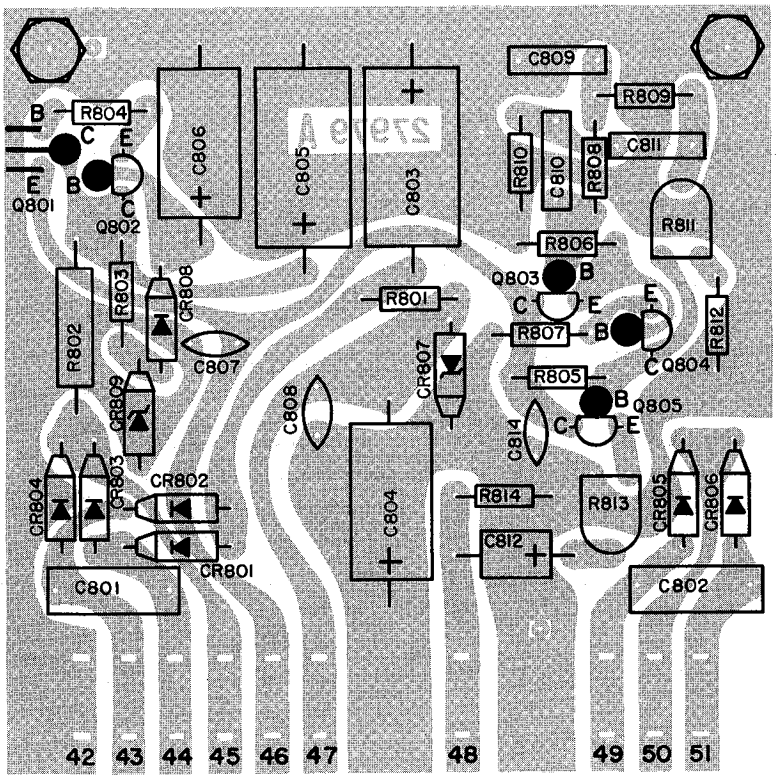
SCHEMATIC DIAGRAM — CITATION FIFTEEN



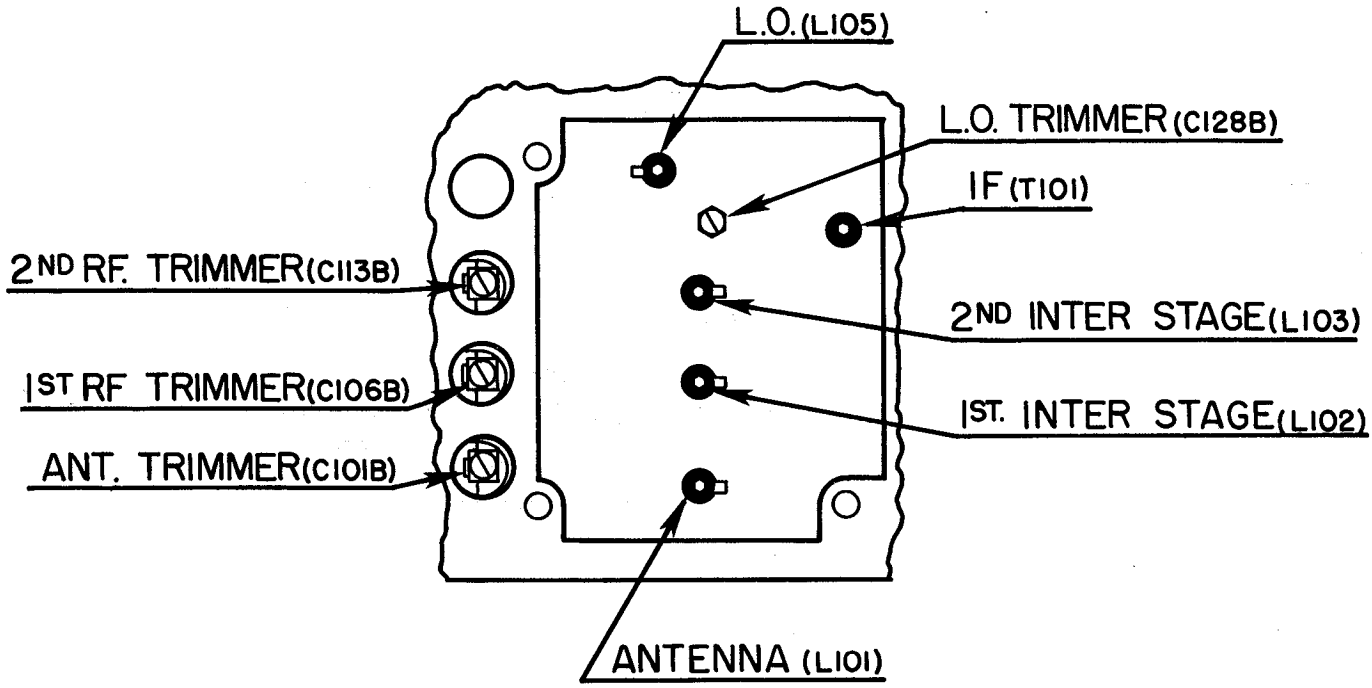


TRANSISTORS EQUIVALENT		
Q NO.	HK P/NO.	2N NO.
Q302-303 Q401-403 Q501-504 Q802-805 Q901-922	43025972	SIMILAR TO 2N3417
Q304	43027722	SIMILAR TO 2N5087
Q301	43028065	SIMILAR TO 2N2857
Q801	43028064	NONE

POWER SUPPLY/OSCILLATOR BOARD



TUNER FRONT END DIAGRAM



BOTTOM VIEW

REPLACEMENT PARTS LIST

CIRCUIT REF.	DESCRIPTION	HK PART NO.
	INTEGRATED CIRCUITS	
A1-A300	Not Used	
A301, A302	IC RCA CA 3076	43128240
A303-A400	Not Used	
A401	IC Motorola MC 1310	43128071
	CAPACITORS	
C1	Disc, .01 UF +80, −20%, 100V	30418491
C2	Mylar, .22 UF ±10%, 100V	30219145
C3	Not Used	
C4	Disc, .01 UF +80, −20%, 100V	30418491
C5	Mylar, 1 UF ±10%, 100V	31918839
C6	Lytic, 100 UF, 100V, 1000 UF, 50V, 1000 UF, 6V	31437778
C7, C8	Not Used	
C9	Disc, .01 UF (1500 VRMS @ 60Hz)	30419090
C10-C100	Not Used	
C101-C126	P/O FM Front End	Not Supplied
C127-C300	Not Used	
C301, C302	Disc, .01 UF +80, −20%, 100V	31718930
C303, C304	Disc, .01 UF +80, −20%, 100V	31718930
C305, C306	Disc, .01 UF +80, −20%, 100V	31718930
C307, C308	Disc, .01 UF +80, −20%, 100V	31718930
C309, C310	Disc, .01 UF +80, −20%, 100V	31718930
C311	Lutic, 100 UF, 15V	31818880
C312, C313	Disc, .01 UF +80, −20%, 100V	31718930
C314	Lytic, 5 UF, 15V	31818834
C315, C316	Disc, .01 UF +80, −20%, 100V	31718930
C317	Disc, .01 UF +80, −20%, 100V	31718930
C318, C319	Disc, 33 PF ±10%, 500V	31718947
C320	Disc, .002 UF ±10%, 500V	31718794
C321	Lytic, 10 UF, 15V	32418571
C322	Disc, .002 UF ±10%, 500V	31718794
C323	Disc, 47 PF ±10%, 500V	31719149
C324	Mylar, .003 UF ±10%, 100V	31919101
C325	Disc, 680 PF ±10%	30418372
C326	Disc, 150 PF ±10%	31718873
C327, C328	Lytic, 100 UF, 15V	31818880
C329, C330	Disc, .01 UF +80, −20%, 100V	31718930
C331	Disc, .01 UF +80, −20%, 100V	31718930
C332-C400	Not Used	
C401	Mylar, .012 UF ±10%, 250V	31919130
C402	Lytic, 10 UF, 15V	31518926
C403	Lytic, 100 UF, 15V	31818880
C404	Mylar, .047 UF ±10%, 100V	31918808
C405	Polystyrene, 680 PF ±5%, 63V	30619136
C406	Mylar, .22 UF ±10%, 100V	31918791
C407	Mylar, .47 UF ±10%, 100V	31918842
C408	Mylar, .22 UF ±10%, 100V	31918791
C409, C410	Polystyrene, 13200 PF ±1%, 63V	30619134
C411, C412	Polystyrene, 6800 PF ±1%, 63V	30619133
C413, C414	Lytic, 10 UF, 15V	31518926
C415, C416	Mylar, .012 UF ±10%, 250V	31919130
C417, C418	Mylar, .022 UF ±10%, 250V	31919099
C419, C420	Mylar, .022 UF ±10%, 250V	31919099
C421, C422	Mylar, .012 UF ±10%, 250V	31919130
C423, C424	Lytic, 100 UF, 15V	31518129
C425, C426	Polystyrene, .005 UF ±5%, 63V	30619112
C427-C500	Not Used	
C501, C502	Mylar, 1 UF ±10%, 100V	31918839
C503, C504	Lytic, 10 UF, 35V	31518805
C505, C506	Lytic, 10 UF, 35V	31518805
C507, C508	Lytic, 200 UF, 15V	31518802
C509, C510	Disc, 22 PF ±10%, 500V	31718798
C511-C800	Not Used	
C801, C802	Mylar, .15 UF ±10%, 250V	31919119
C803	Lytic, 50 UV, 50V	31519122
C804	Lytic, 100 UF, 25V	31519121
C805	Lytic, 100 UF, 35V	31519120
C806	Lytic, 100 UF, 25V	31519121
C807, C808	Disc, .01 UF +80, −20%, 100V	31719830
C809	Mylar, .039 UF ±10%, 100V	31919118
C810, C811	Mylar, .01 UF ±10%, 250V	31918774
C812	Lytic, 10 UF, 15V	31518926
C813	Not Used	
C814	Disc, .01 UF +80, −20%, 100V	31718930
C815-C900	Not Used	
C901	Polystyrene, 18000 PF ±1%, 63V	30619138
C902	Polystyrene, 9000 PF ±1%, 63V	30619137
C903, C904	Disc, 68 PF ±10%	31722086
C905	Polystyrene, 510 PF ±10%, 63V	30619124
C906	Disc, 100 PF	31718778
C907	Mylar, .1 UF ±10%, 100V	31918784
C908	Polystyrene, 510 PF ±10%, 63V	30619124
C909	Disc, .003 UF ±10%	31718832
C910	Disc, 100 PF	31718778
C911	Mylar, .1 UF ±10%, 100V	31918784
C912	Lytic, 500 UF, 6V	31519123
C913, C914	Disc, 100 PF	31718778
C915	Lytic, 5 UF, 16V	31519146
C916	Lytic, 10 UF, 15V	32418571

CIRCUIT REF.	DESCRIPTION	HK PART NO.
	DIODES	
CR1, CR2	Diode 1N4154	41622859
CR3-CR300	Not Used	
CR301, CR302	Diode 1N4154	41622859
CR303	Zener, 10V, 1W	42020737
CR304-CR800	Not Used	
CR801, CR802	Diode, 2A, 100V	41020618
CR803, CR804	Diode, 2A, 100V	41020618
CR805, CR806	Diode, 200V, PIV, 750mA	41022464
CR807	Zener, 16V, 1W, 10%	42027092
CR808	Diode, 2A, 100V	41020618
CR809	Zener, 16V, 1W, 10%	42027092
CR810-CR1100	Not Used	
	FILTER	
F301	IF Filter	12027962
	COILS	
L1-L100	Not Used	
L101	P/O FM Front End	Not Supplied
L102-L300	Not Used	
L301	Ratio Detector	11027909
L302-L400	Not Used	
L401, L402	Inductor, 15mH, VAR	12027960
L403, L404	Inductor, 16.7mH, VAR	12027961
L405, L406	Inductor, 15mH, VAR	12027960
L407, L408	Inductor, 16.7mH, VAR	12027961
L409-L900	Not Used	
L901, L902	Inductor, 3.3mH	12028060
	TRANSISTORS	
Q1-Q100	Not Used	
Q101-Q104	P/O FM Front End	Not Supplied
Q105-Q300	Not Used	
Q301	Transistor, RF RCA 40897	43028065
Q302, Q303	Transistor	43025972
Q304	Transistor	43027722
Q305-Q400	Not Used	
Q401-Q403	Transistor	43025972
Q404-Q500	Not Used	
Q501-Q504	Transistor	43025972
Q505-Q800	Not Used	
Q801	Transistor Regulator	43028064
Q802-Q805	Transistor	43025972
Q806-Q900	Not Used	
Q901-Q920	Transistor	43025972
Q921	Not Used	
Q922, Q923	Transistor	43025972
Q924-Q1100	Not Used	

CIRCUIT REF.	DESCRIPTION	HK PART NO.
	RESISTORS	
R1	220 ±10%, ¼W	33212211
R2	150K ±10%, ¼W	33321541
R3	Not Used	
R4, R5	Slide Pot, 10K Volume	21427880
R6	250 Stereo Threshold Control	21528230
R7	500 FM Muting Control	21528229
R8	Not Used	
R9	1.2K ±10% ½W	33311221
R10	2.2M ±10%, ½W	33312251
R11	82 ±10%, ½W	33318201
R12	100K ±10%, ¼W	33211041
R13	10K ±10%, ¼W	33211031
R14-R100	Not Used	
R101-R113	P/O FM Front End	Not Supplied
R114-R300	Not Used	
R301	68K ±10%, ¼W	33216831
R302	22 ±10%, ¼W	33212201
R303, R304	220 ±10%, ¼W	33212211
R305	470 ±10%, ¼W	33214711
R306	100 ±10%, ¼W	33211011
R307	10 ±10%, ¼W	33211001
R308, R309	470 ±10%, ¼W	33214711
R310	4.7K ±10%, ¼W	33214721
R311	100 ±10%, ¼W	33211011
R312	150 ±10%, ¼W	33211511
R313	56 ±10%, ½W	33315601
R314	68 ±10%, ¼W	33216801
R315, R316	1.2K ±5%, ¼W	33211225
R317, R318	5.6K ±5%, ¼W	33215625
R319, R320	6.8K ±10%, ¼W	33216821
R321	47K ±10%, ¼W	33214731
R322	1K Trim Pot Linear (Hor Mtg)	23 28062
R323	82K ±10%, ¼W	33218231
R324	33K ±10%, ¼W	33213331
R325	25K Trim Pot Linear (Hor Mtg)	23527511
R326	220K ±10%, ¼W	33212241
R327	2.2K ±10%, ¼W	33212221
R328, R329	10K ±10%, ¼W	33211031
R330	470 ±10%, ¼W	33214711
R331-R400	Not Used	
R401	2.2K Trimpot Linear (Hor Mtg)	23528063
R402	15K ±10%, ¼W	33211531
R403	47 ±10%, ¼W	33214701
R404	Not Used	
R405	5K Trimpot Linear (Hor Mtg)	23528061
R406	15K ±10%, ¼W	33211531
R407	1K ±10%, ¼W	33211021
R408	82 ±10%, ¼W	33218201
R409	10K ±10%, ¼W	33211031
R410	1K ±10%, ¼W	33211021
R411, R412	3.9K ±10%, ¼W	33213924
R413, R414	330K ±10%, ¼W	33213341

RESISTORS

CIRCUIT REF.	DESCRIPTION	HK PART NO.
R415, R416	1K ±10%, ¼W	33211021
R417, R418	470 ±10%, ¼W	33214711
R419, R420	1K ±10%, ¼W	33211021
R421	2.2K ±10%, ¼W	33212221
R422-R500	Not Used	
R501, R502	470K ±10%, ¼W	33214741
R503, R504	150K ±10%, ¼W	33211541
R505, R506	390 ±10%, ¼W	33213911
R507, R508	68K ±10%, ¼W	33216831
R509, R510	5.6K ±10%, ¼W	33215621
R511, R512	100 ±10%, ¼W	33211011
R513, R514	3.3K ±10%, ¼W	33213321
R515, R516	220 ±10%, ¼W	33212211
R517-R800	Not Used	
R801	1.5K ±10%, ½W	33311521
R802	27 ±10%, 3W WW	36612701
R803	2.7K ±10%, ¼W	33212721
R804	33 ±10%, ¼W	33213301
R805	2.2K ±10%, ¼W	33212221
R806	3.3K ±10%, ¼W	33213321
R807	150 ±10%, ¼W	33211511
R808, R809	47K ±10%, ¼W	33214731
R810	4.7K ±10%, ¼W	33214721
R811	100K Trimpot Linear (Hor Mtg)	23526611
R812	56K ±10%, ¼W	33215631
R813	4.7K Trimpot Linear (Hor Mtg)	23528061
R814	220K ±10%, ¼W	33212241
R815-R900	Not Used	
R901	3.9K ±2%, ¼W	33213924
R902	25K Trimpot Linear (Hor Mtg)	23527511
R903	10K ±10%, ¼W	33211031
R904	100 ±10%, ¼W	33211011
R905	100K ±10%, ¼W	33211041
R906	10K ±10%, ¼W	33211031
R907	1K ±10%, ¼W	33211021
R908	10K ±10%, ¼W	33211031
R909	5K Trimpot (Vert. Mtg)	23523349
R910	1M ±10%, ¼W	33211051
R911	100 ±10%, ¼W	33211011
R912	100K ±10%, ¼W	33211041
R913	10K ±10%, ¼W	33211031
R914, R915	1K ±10%, ¼W	33211021
R916	1K Trimpot Linear (Hor Mtg)	23528062
R917	10K ±10%, ¼W	33211031
R918	33K ±10%, ¼W	33213331
R919	1K ±10%, ¼W	33211021
R920	10K ±10%, ¼W	33211031
R921	100K ±10%, ¼W	33211041
R922	2.2K ±10%, ¼W	33212221
R923	10K ±10%, ¼W	33211031
R924	22 ±10%, ¼W	33212201
R925	1K ±10%, ¼W	33211021
R926	15K ±10%, ¼W	33211521
R927	1K ±10%, ¼W	33211021
R928	22K ±10%, ¼W	33212231
R929	10 ±10%, ¼W	33211001
R930	1K ±10%, ¼W	33211021
R931	3.3K ±10%, ¼W	33213321
R932, R933	1K ±10%, ¼W	33211021
R934	1M ±10%, ¼W	33211051
R935, R936	470 ±10%, ¼W	33214711
R937	3.3K ±10%, ¼W	33213321
R938	220K ±10%, ¼W	33212241
R939	3.3K ±10%, ¼W	33213321
R940	220K ±10%, ¼W	33212241

TRANSFORMER

T1	Power Transformer	10128146
T2	Antenna, Matching Transformer	11027970
T3-T100	Not Used	
T101-T105	P/O FM Front End	Not Supplied

MISCELLANEOUS

Knob, Pushbutton (Large)	00228156
Knob, Slide	63228033
Knob, Pushbutton (Small)	00226644
Escutcheon	00228150
Plexiglas	61628155
Top Cover	60127959
Bottom Plate	60127788
Rubber Feet	62011692
Tape Out Jack	65428021
Tuning Meter	12527943
Quieting Meter	12527942
Meter Shield	61828167
Tuning Knob	63228003
Tuning Drum	61627677
Dial Scale	91228216
Dial Drum Shield	61828026
Planetary Drive	60427035
Tuning Knob Bracket	60127681
Drum Mounting Bracket	60127680
Light Shield Controls	61426352
Pushbutton Switch Dolby, Tone Level Set	25027902
Pushbutton Switch Power, Mute	25027964
AC Slide Switch W/Solder Shield & Cover	24526153

CIRCUIT REF.	DESCRIPTION	HK PART NO.	CIRCUIT REF.	DESCRIPTION	HK PART NO.
	MISCELLANEOUS				
	Pushbutton, Stereo, Auto-Mono	25029244		Antenna Terminal Strip	65427994
	Pushbutton, Stereo, Noise Filter	25026151		Phono Jack Assembly	65428148
	FM Front End	00228147		IF/Meter Amp P. C. Board W/Components	00127751
	Lamp (Power)	46528051		MPX & MPX Filter P. C. Board W/Components	00127757
	Lamp (Meter)	46528050		Meter/Muting P. C. Board W/Components	00127744
	Lamp (Dial)	46528050		Output P. C. Board W/Components	00127763
	Green Filter (Dial Lamp)	61228074		Power Supply/Oscillator P. C. Board W/Components	00127978
	Lamp (Stereo)	46528004		P. C. Board Connector Housing	65425952
	Fuse Holder	65427001		P. C. Board Connector Terminal Pin (Male)	65425915
	Light Shield	61828223		Owner Manual	90728152
	Line Cord	53021115		Technical Manual	90728153
	Strain Relief	65421116			
	AC Receptacle	65412751			

NOTE: To speed handling of your order be sure to include both the model and serial numbers which appear at the back of the chassis, in addition to the quantity, part number and part description of the items ordered. Orders from independent dealers, independent servicemen, and retail customers will be shipped on a cash in advance basis. Harman-Kardon reserves the right to substitute equivalent parts for those originally installed in this chassis. All parts should be ordered from Harman-Kardon, 55 Ames Court, Plainview, L.I., N.Y. 11803, Att: Parts Department.